and means for analyzing the results of the measured responses in order to identify the presence and/or concentrations of the analyte gas component(s).

This invention also provides for a chemical sensor device for directly sensing the presence and/or concentration of gas component(s) in a multi-component gas system, comprising: a substrate; an array of at least two chemo/electro-active materials deposited on said substrate; a means for detecting a change in electrical properties of said chemo/electro-active materials upon exposure to said multi-component gas component(s); means for analyzing the results of the detected changes in electrical properties in order to identify the presence and/or concentrations of said gas component(s); and a housing. The chemo/electro-active materials may be semiconducting materials.

In another embodiment, this invention involves an apparatus for analyzing at least one individual gas component in a multi-component gas mixture, containing:

(a) an array of at least two chemo/electro-active materials connected in parallel circuitry, each chemo/electro-active material exhibiting a different electrical response characteristic upon exposure to the individual gas component than each other chemo/electro-active material;

(b) means for determining an electrical response of each chemo/electro-active material upon exposure of the array to the gas mixture;

(c) means for determining a value for the temperature of the array connected in parallel circuitry with the chemo/elctro-active materials; and

(d) means for digitizing the electrical responses and the temperature value, and calculating a value from the digitized electrical responses and temperature value, to perform an analysis of the individual gas component.

In a further embodiment, this invention involves, in a multi-component gas mixture having a temperature

of about 400°C or more, an apparatus for calculating the concentration of at least two individual analyte gas components in the mixture, containing:

(a) an array of at least three chemo/electro-active materials, the array being situated within the gas mixture, and each chemo/electro-active material having a different electrical response characteristic upon exposure to each of the individual analyte gas components than each of the other chemo/electro-active materials;

(b) means for determining an electrical response of each chemo/electro-active material upon exposure of the array to the unseparated components of the gas mixture; and

(c) means for calculating the concentration of each of the individual analyte gas components from the electrical responses of the chemo/electro-active materials upon exposure to the multi-component gas mixture only.

In yet another embodiment, this invention involves, in a multi-component gas mixture having a temperature of about 400°C or more, an apparatus for calculating the concentration of at least two individual analyte gas components in the mixture, containing:

(a) an array of at least three chemo/electro-active materials connected in parallel circuitry, the array being situated within the gas mixture, and each chemo/electro-active material exhibiting a change in electrical resistance upon exposure to each of the individual analyte gas components, wherein at least one chemo/electro-active material, when at a temperature of about 400°C or more, (i) has an electrical resistivity in the range of about 1 ohm-cm to about 10^5 ohm-cm, and (ii) exhibits a change in electrical resistance of at least about 0.1 percent upon exposure of the material to an analyte gas component, as compared to the resistance before exposure;

(b) means for determining the change in resistance of each chemo/electro-active material upon exposure of the array to the gas mixture; and

(c) means for calculating the concentration of each of the individual analyte gas components from the changes in resistance of the chemo/electro-active materials.

In yet another embodiment, this invention involves an apparatus for analyzing at least one individual gas component in a multi-component gas mixture, containing:

(a) an array of at least two chemo/electro-active materials, each chemo/electro-active material having a different electrical response characteristic upon exposure at a selected temperature to the individual gas component than each of the other chemo/electro-active materials, the electrical response characteristic of each material being quantifiable as a value, wherein the response value of at least one material is constant or varies by no more than about twenty percent during exposure of the material to an individual gas component at the selected temperature for a period of at least about one minute;

(b) means for determining the electrical response value of each chemo/electro-active material upon exposure of the array to the gas mixture; and

(c) means for performing an analysis of the individual gas component from the electrical response values.

In yet another embodiment, this invention involves, in a multi-component gas mixture having a temperature of less than about 400°C, an apparatus for analyzing at least one individual gas component in the mixture, containing:

(a) an array of at least two chemo/electro-active materials, each chemo/electro-active material having a different electrical response characteristic upon exposure at a selected temperature to the individual gas component than each of the other chemo/electro-